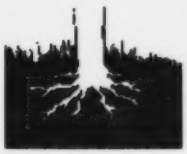


Root Disease Management Course

Participant's Guide

Contents

- Introduction
- Root Disease Management Course Overview "Default"
- Root Disease Management Course Overview "Alternate"
- Root Disease Management Training Course Expectations and Objectives
- Root Disease Management Training Course Field Session Preparation
- About Regulations, Standards and Guide Books
- Diseases Discussed in the RDM Guide
- Root Disease Five-Phase Management Process
- The Tools in the RDM Guidebook
- Role of Root Disease in Unmanaged Forests
- Role of Root Disease in Managed Forests
- Distribution of Armillaria Root Disease
- Distribution of Tomentosus Root Rot
- Distribution of Laminated Root Rot
- Relationship Between Age of Tree and Root Disease
- Armillaria Root Disease
- Laminated Root Rot
- Tomentosus Root Disease
- Landscape Level Hazard and Risk Assessment
- Disease Identification
- At The Stand Level, Look For These Symptoms
- At the Tree Level, Look For These Symptoms
- Signs are Visible Only at the Tree Level
- Root Disease Identification Classroom Session
- Root Disease Identification Field Session
- Root Disease Five-Phase Management Process - Step 2
- Root Disease Five-Phase Management Process - Step 3
- Root Disease Survey Methods
- Root Disease Five-Phase Management Process - Step 4
- Future Stand Risk Assessment
- Root Disease Five-Phase Management Process - Step 5
- Field Session
- Stand Management Prescriptions by Disease Treatment Level
- Silviculture Prescriptions by Disease Treatment Level
- Strategies and Tactics for Stand Management Prescriptions
- Strategies and Tactics for Silviculture Prescriptions
- Final Exercise
- Acronym Glossary

Back to the top

Introduction

The Root Disease Management Training Course has been developed to provide training in root disease management to forestry management personnel working in the various regions of the province. The course has been structured to follow the Root Disease Management Guidebook (RDM Guide). In fact, one of the main reasons for the development of the course is the need to to introduce this guide to forestry professionals and technicians; the RDM Guide supports the associated sections of the Forestry Practices Code and regulations and standards and provides a methodology for the management of root disease.

In addition, and no less importantly, the course is intended to give you practical, hands-on experience in root disease identification and management through various exercises, discussions and field sessions.

Organization

The Root Disease Management Training Course is delivered in five sections: three classroom sessions and two filed sessions. The length of these sessions, their emphases, and order of their presentation may be adjusted by the instructor according to the general knowledge of your participant group and the logistical requirements of the field sessions. For a complete list of subjects which will be covered during the course, refer to the list above.

Layout of the Participant's Guide

This On-Line Participant's Guide has been designed to follow the content of the instructor's presentation; each section in this guide displays a copy of the overhead used in the course, as well as a list of learning objectives which are to be met in each learning session. Exercises which will be conducted during the course are detailed in the appropriate locations.

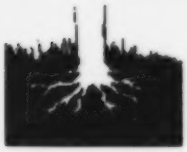
Acronym Glossary

Your Participant's Guide also contains an acronym glossary related to root disease identification.

Back to the top

Root Disease Management Course Main Page

Ministry of Forests Main Page



Root Disease Management Course Overview "Default"

Day 1, Classroom Session 1 - about 3 hours	Day 1, Field Session 1 - about 4 hours	Day 1 or 2, Classroom Session 2 - about 1.5 hours	Day 2, Field Session 2 - about 4 hours	Day 2, Classroom Session 3 - about 3 hours
Course Introduction and Overview The Forest Practices Code Disease Management Guidebook -Its Role -Its Contents The Role and Impact of Root Disease (Optional) Step 1 of the Five-Phase Management Process Root Disease Identification (in the Classroom)	Root Disease Identification in the Field	The Five-Phase Root Disease Management Process 1. Landscape Level Hazard and Risk Assessment 2. Silviculture Prescription Walk-through Reconnaissance 3. Disease Assessment and Stratification Survey 4. Future Stand Assessment 5. Evaluation and Final Prescription	Perform/Observe Steps 2 and 3 of the Five-Phase Management Process: - Perform a Silviculture Prescription Walk-through Reconnaissance and determine the level of disease - Recommend for or against a survey and recommend a survey method - Observe a root disease survey - Observe the forest site and disease conditions where data were collected for use in Classroom Session 3	Perform Steps 4 and 5 of the Five-Phase Management Process: - Based on participant's observation from Field Session 2 and data provided by the instructor (data gained from the survey prepared by the instructor), perform a Future Stand Risk Assessment - Develop a Root Disease Treatment Evaluation - Develop a Final Prescription using strategies and tactics

				from the RDM Guide.

Day 1 Classroom Session 1

The Forest Practices Code Root Disease Management Guide Book:

A.The Role of the RDM Guide Book
B. What the RDM Guide Book Contains

The Role and Impact of Root Disease

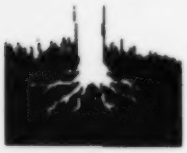
Step 1 of the Five-Phase Management Process (Optional)

Root Disease Identification

Participant Objectives

- **Understand the skills which should be obtained through this course.**

[Next] [Participant's Guide Table of Contents] [Root Disease Management Course Home Page]



Root Disease Management Course Overview "Alternate"

Day 1, Classroom Session 1 - about 2.5 hours	Day 1, Classroom Session 2 - about 2 hours	Day 1, Field Session 1 - about 4 hours	Day 2, Field Session 2 - about 4 hours	Day 2, Classroom Session 3 - about 3 hours
Course Introduction and Overview The Forest Practices Code Disease Management Guidebook -Its Role -Its Contents The Role and Impact of Root Disease Root Disease Identification (in the Classroom)	The Five-Phase Root Disease Management Process 1. Landscape Level Hazard and Risk Assessment 2. Silviculture Prescription Walk-through Reconnaissance 3. Disease Assessment and Stratification Survey 4. Future Stand Assessment 5. Evaluation and Final Prescription	Root Disease Identification in the Field	Perform/Observe Steps 2 and 3 of the Five-Phase Management Process: - Perform a Silviculture Prescription Walk-through Reconnaissance and determine the level of disease - Recommend for or against a survey and recommend a survey method - Observe a root disease survey - Observe the forest site and disease conditions where data were collected for use in Classroom Session 3	Perform Steps 4 and 5 of the Five-Phase Management Process: - Based on participant's observation from Field Session 2 and data provided by the instructor (data gained from the survey prepared by the instructor), perform a Future Stand Risk Assessment - Develop a Root Disease Treatment Evaluation - Develop a Final Prescription using strategies and tactics

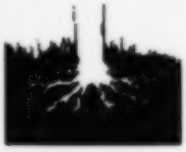
				from the RDM Guide.

Participant Objectives

- **Understand the skills which should be obtained through this course.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Root Disease Management Training Course Expectations and Objectives

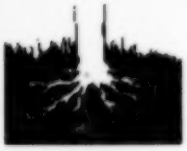
Long-Term Expectations	Short Term Expectations
• Root disease management is a complex process which requires a great deal of decision-making; participants will take the knowledge they gain in this course and work with it regularly in the filed so as to become adept at root disease management	• Become familiar with the Five-Phase Root Disease Management Process as outlined in the Root Disease Management Guidebook. • Become familiar with the role and contents of the Forest Practices Code Root Disease Management Guidebook • Gain the habit of referring to the Forest Practices Code Root Disease Management Guidebook when dealing with root disease issues • Become familiar with the signs and symptoms of root disease; become reasonably proficient in identifying root disease in the field • Learn how to apply the various steps in the Management Process to actual root disease in the field • Be able to develop an appropriate prescription for root disease observed in the field

Participant Objectives

- **Understand the skills which should be obtained through this course.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]

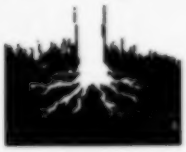


Root Disease Management Training Course Field Session Preparation

Field Session 1 **Root Disease Identification**	**Field Session 2** **Silviculture Prescription Walk-through, Reconnaissance & Disease Assessment and Stratification Survey**
During Field Session 1, you will be visiting __ site(s) to perform Root Disease Identification in the field. Other field work will include: _____ You are to meet at _____ location at _____time. Lunch will/will not be provided.	During Field Session 2, you will be visiting __ sites to perform a Silviculture Walk-through Assessment and observe a survey which will be prepared ahead of time (time does not allow us to conduct a survey during the class). Other field work will include:_____ You are to meet at _____ location at _____time. Lunch will/will not be provided.
Equipment to bring for both field sessions:	
- wear suitable clothing and footwear (each field session will last about four hours); don't forget rain gear. - A knife - A pulaski or similar tool	- A hip chain - Your Participant's Guidebook -The Field Guide to Pests - The handouts given to you by the instructor of site maps and exercise instructions.

Participant Objectives

- **Understand and be able to explain the role of the RDM Guide.**
- Learn how to consider root disease in silviculture and stand management prescriptions.
- Be able to assess the inherent root disease risk in a particular zone.
- Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.



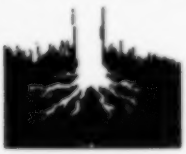
About Regulations, Standards and Guide Books

Participant Objectives

- **Understand the skills which should be obtained through this course.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Diseases Discussed in the RDM Guide

Code	Common Name
DRL	Laminated Root Rot
DRT	Tomentosus Root Rot
DRA	Armillaria Root Disease
DRN	Annosus Root Disease
DRB	Blackstain Root Disease

Participant Objectives

- **Understand and be able to explain the role of the RDM Guide.**
- Learn how to consider root disease in silviculture and stand management prescriptions.
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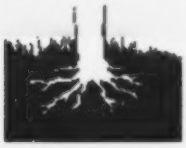
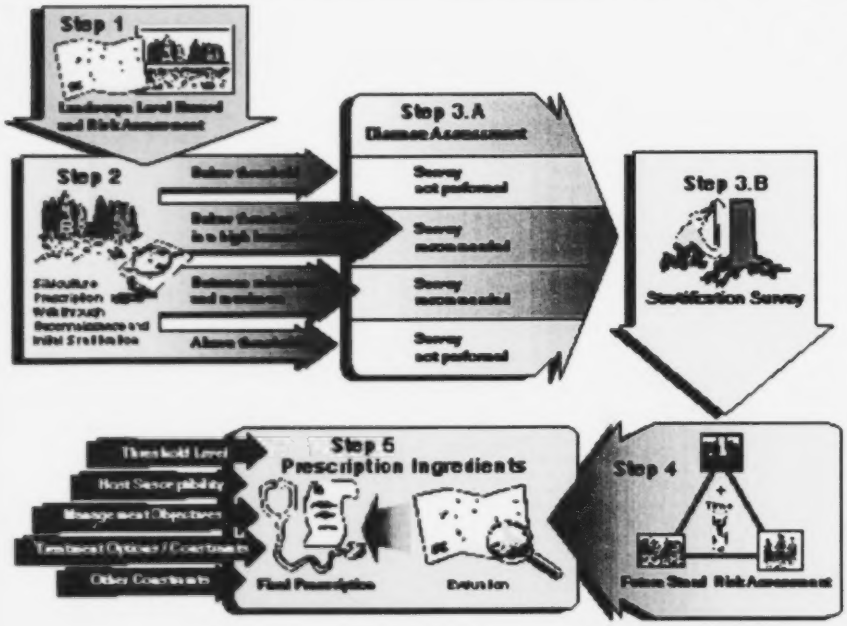
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Root Disease Five-Phase Management Process



Participant Objectives

- **Understand and be able to explain the role of the RDM Guide.**
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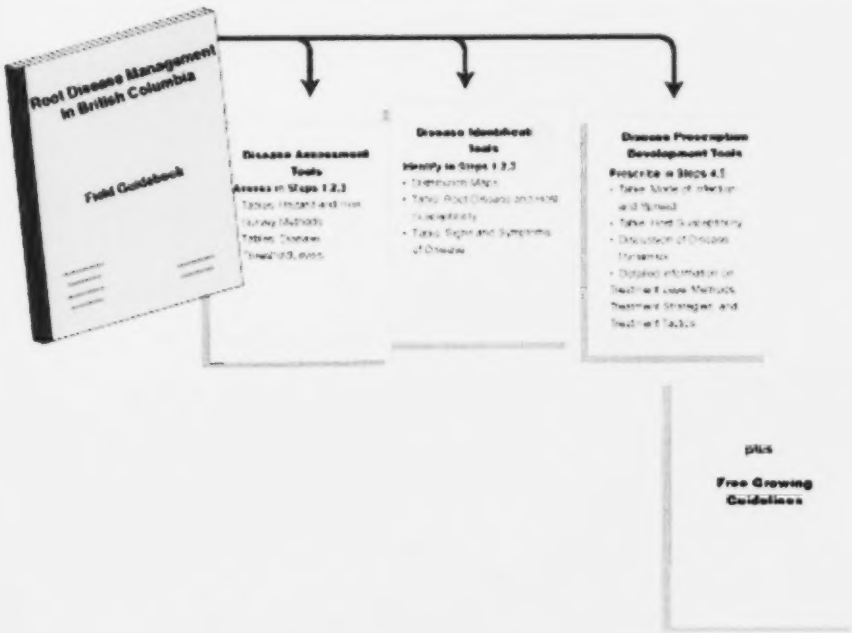
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]

The Tools in the RDM Guidebook



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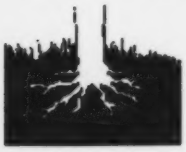
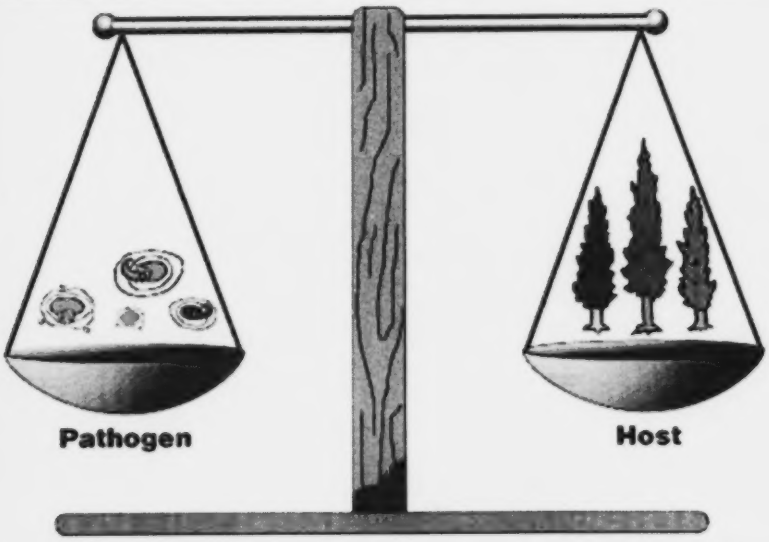
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



The Role of Root Disease in Unmanaged Forests

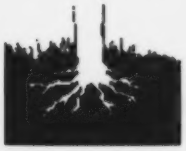


Participant Objectives

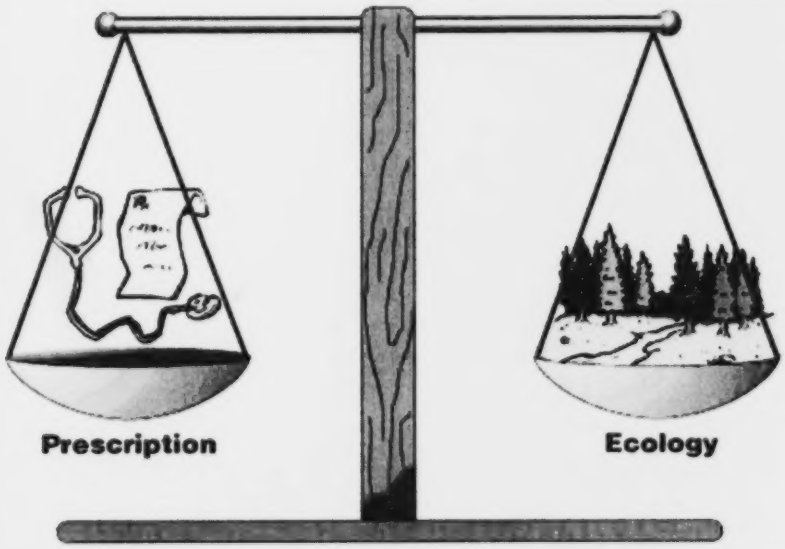
- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
- Be able to assess the inherent root disease risk in a particular zone.
- Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



The Role of Root Disease in Managed Forests



Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
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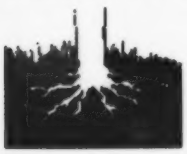
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



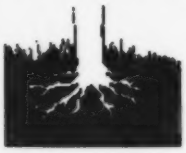
Distribution of Armillaria Root Disease

Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
- Be able to assess the inherent root disease risk in a particular zone.
- Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Distribution of Tomentosus Root Rot

Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
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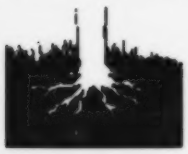
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Distribution of Laminated Root Rot

Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
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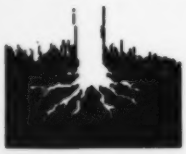
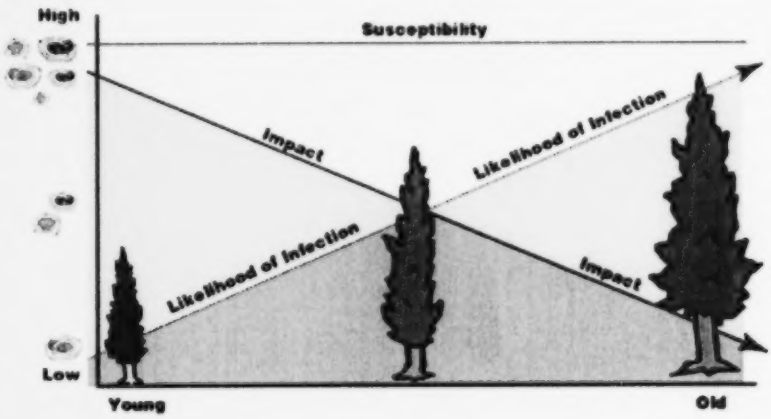
- Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Relationship Between Age of Tree and Root Disease



Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
- Be able to assess the inherent root disease risk in a particular zone.
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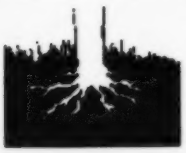
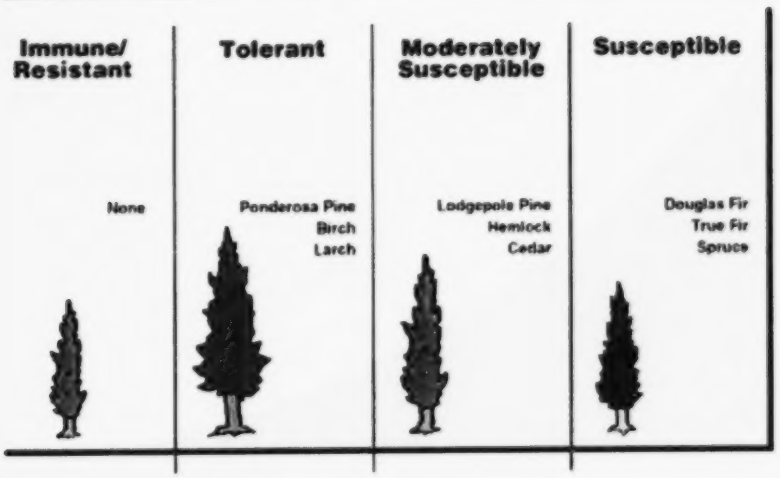
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Armillaria Root Disease



Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
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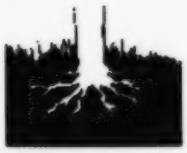
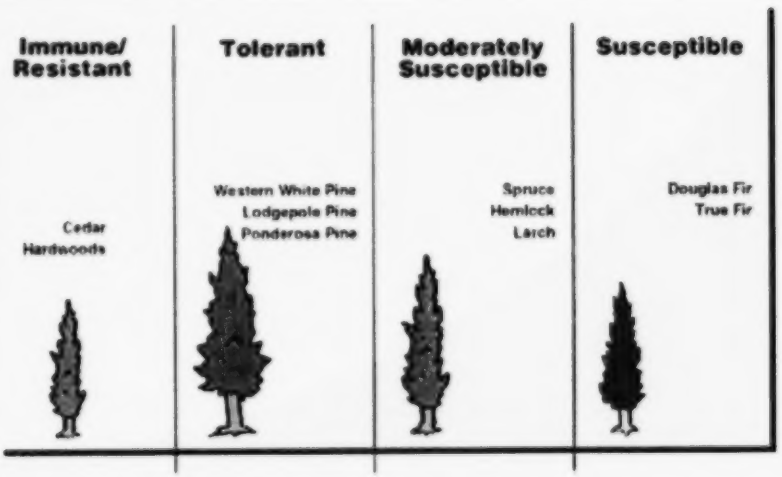
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Laminated Root Rot

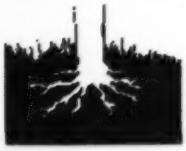


Participant Objectives

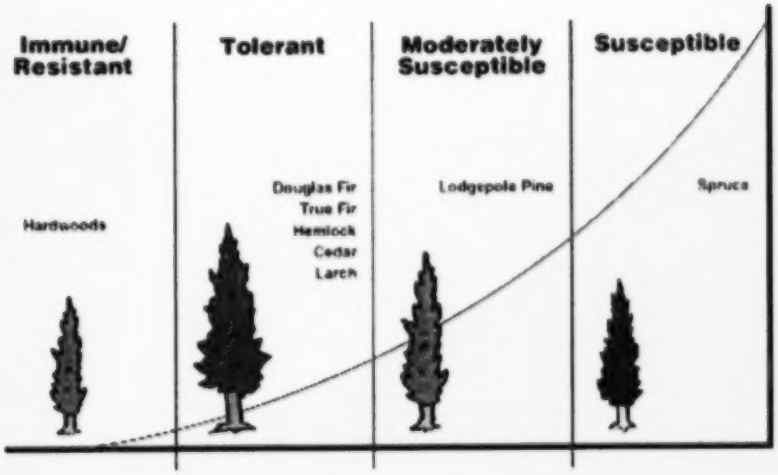
- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
- Be able to assess the inherent root disease risk in a particular zone.
- Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Tomentosus Root Disease



Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- **Learn how to consider root disease in silviculture and stand management prescriptions.**
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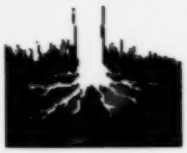
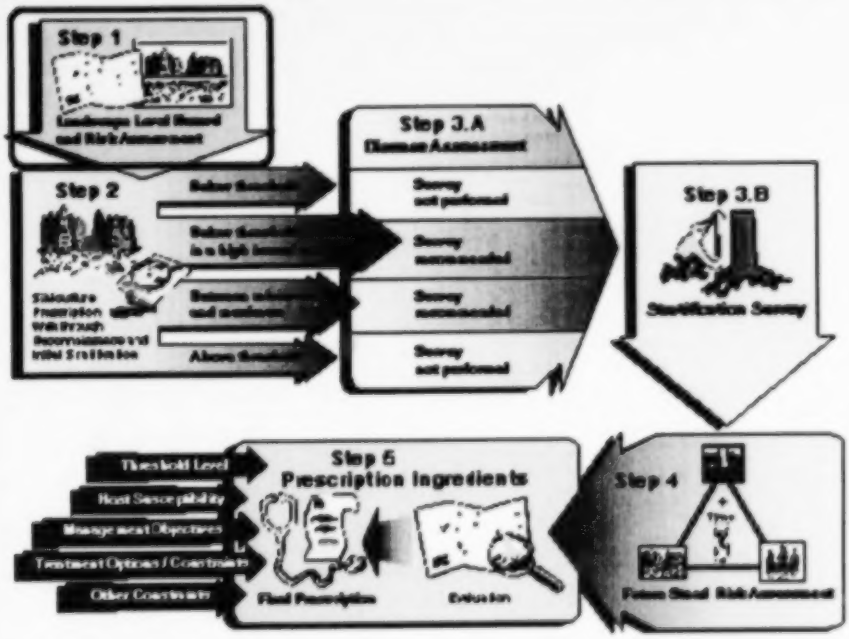
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Landscape Level Hazard and Risk Assessment



Participant Objectives

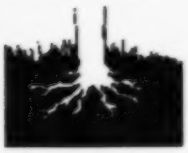
- Understand and be able to explain the role of the RDM Guide.
- Learn how to consider root disease in silviculture and stand management prescriptions.
- **Be able to assess the inherent root disease risk in a particular zone.**
- Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.

Exercise

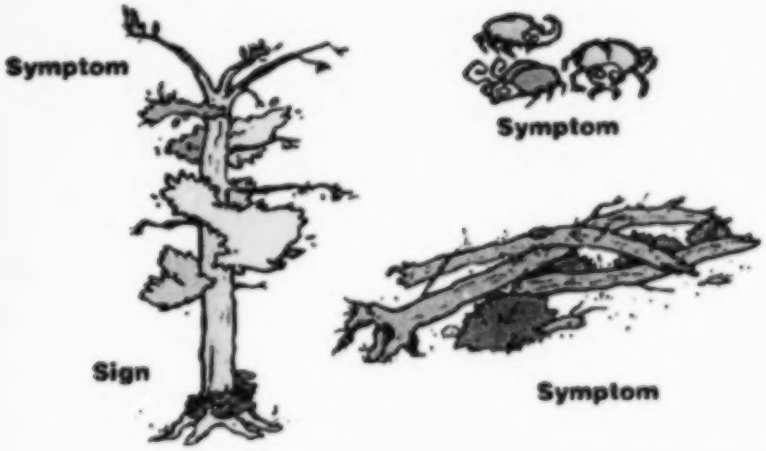
1. Conduct a Landscape Hazard Risk Assessment for your region using the tables in Section 9 of the RDM Guide.
2. Conduct an assessment for the particular site that you will be observing in Field Session 1.
3. Assess the hazard in your region(s). Discuss other factors that may influence the inherent risk such as species type, age of tree, past forest practices, etc.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Disease Identification

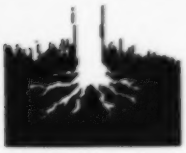


Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- Learn how to consider root disease in silviculture and stand management prescriptions.
- Be able to assess the inherent root disease risk in a particular zone.
- **Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



At the Stand Level, Look for These Symptoms

Laminated Root Rot
- Openings:
  - Distinct, small to large
- Infection centers may be large and fill in with resistant hardwoods
- Species shift to western red cedar and western hemlock
- Randomly-oriented windthrown stems

Tomentosus Root Rot
- Openings:
  - Small with randomly-oriented windthrown stems
  - Diffuse gaps
  - Mixed conifer with hardwoods and other vegetation
- Species shift to true fir

Armillaria Root Disease
- Openings:
  - Mixed conifer with hardwoods and other vegetation
  - On coast, small clumps of trees in young stands
  - In interior, become larger
- Diffusely spread disease centers

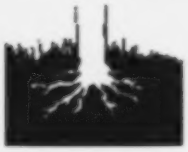
All three diseases
- Poor tree growth and lack of stand vigour
- Insect attack
- Mixture of broadleaved species in conifer stands
- Openings

Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- Learn how to consider root disease in silviculture and stand management prescriptions.
- Be able to assess the inherent root disease risk in a particular zone.
- **Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



At the Tree Level, Look for These Symptoms

Laminated Root Rot
- Red foliage stage at death
- Windthrown trees with few or no roots
- Root balls
- Red-brown stained heartwood (disappears 2 to 3 weeks after harvest)

Tomentosus Root Rot
- Red foliage stage at death only if associated with spruce beetle attack
- Windthrown spruce lack fine root mass
- Pink to red-brown stained heartwood

Armillaria Root Disease
- Red foliage stage at death
- Bent top
- Snags and broken stems
- Basal resinosis
- Stringy and yellowish advanced decay with black zone lines

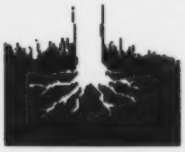
All three diseases
- Chlorotic and thinning foliage (low needle retention)
- Reduced leader growth
- Distress cone crop

Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- Learn how to consider root disease in silviculture and stand management prescriptions.
- Be able to assess the inherent root disease risk in a particular zone.
- **Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Signs are Visible Only at the Tree Level

Laminated Root Rot
- Cream-coloured mycelia on root surface under dull
- Pinhead-sized pits in wood
- Cinnamon-coloured hair-like hyphae
- Annual rings separate into sheets
- Fruiting bodies (rare) on upturned roots, undersides of decaying logs

Armillaria Root Disease
- Mycelia:
  - Cream to white-coloured fan-shaped felts
- On dead trees:
  - Mycelial fan etchings on inner bark, usually associated with resin
- Honey-coloured mushrooms at tree base in fall
- Black shoestring-like rhizomorphs in or around bark of roots (not prolific)

Tomentosus Root Rot
- Canoe-shaped white pitting of heartwood
- Pitting extends to bark with age, follows annual rings
- Honeycomb pattern of decay in execution
- Leathery fan mushroom-like fruiting bodies near decayed roots in fall

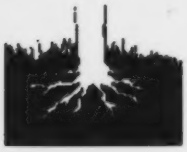
All three diseases
- Fruiting bodies
- Other growths

Participant Objectives

- Understand and be able to explain the role of the RDM Guide.
- Learn how to consider root disease in silviculture and stand management prescriptions.
- Be able to assess the inherent root disease risk in a particular zone.
- **Become familiar with the appearance of the three main root diseases in B.C. under various conditions and in various species.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



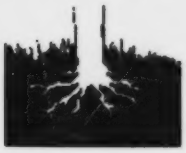
Root Disease Identification Classroom Session

Exercise

1. What is this disease? The instructor will verbally describe some root disease signs and symptoms, and ask you to name the disease he/she is describing. Differentiate between whether the description is a sign or a symptom.
2. The instructor will display slides and samples which you have not yet seen; name the root disease present and give supporting reasons.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Root Disease Identification Field Session

Participant Objectives

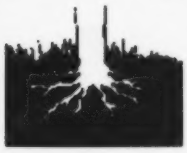
- **Learn how to identify actual cases of root disease in the field.**
- **Be able to identify and describe the associated root disease fungus encountered in the field exercise for selected trees or given specimens.**

Exercise Ideas for Root Disease Identification in the Field

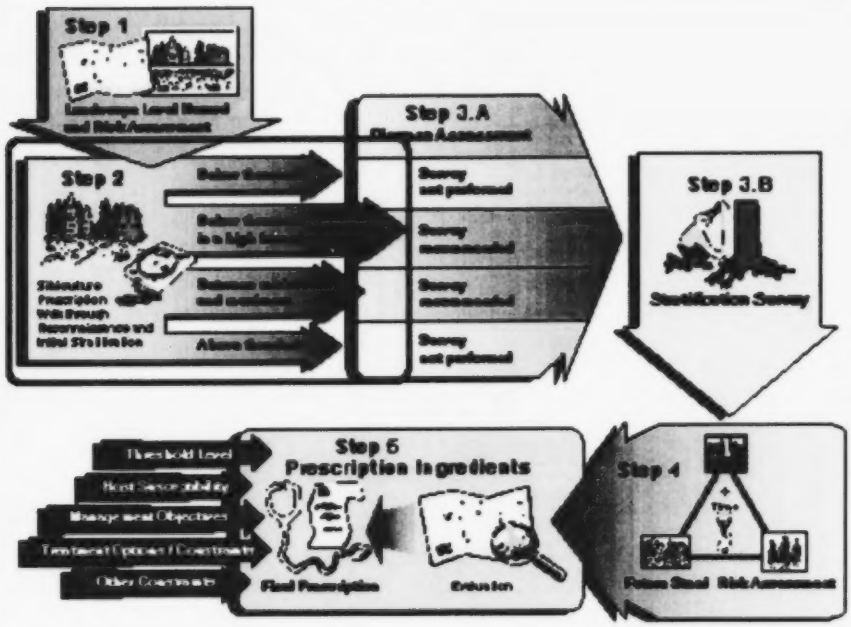
1. Actively engage in identification of root disease.
2. Conduct identification in different parts of the site, and return with, if possible, samples; be prepared to identify and discuss what you've found.
3. Discuss the level of disease observed in light of Step 2 in the Five-Phase Management Process.
4. Discuss forest practices which could help/hurt the root disease observed.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Root Disease Five-Phase Management Process - Step 2

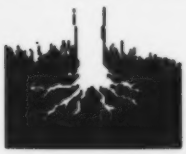


Participant Objectives

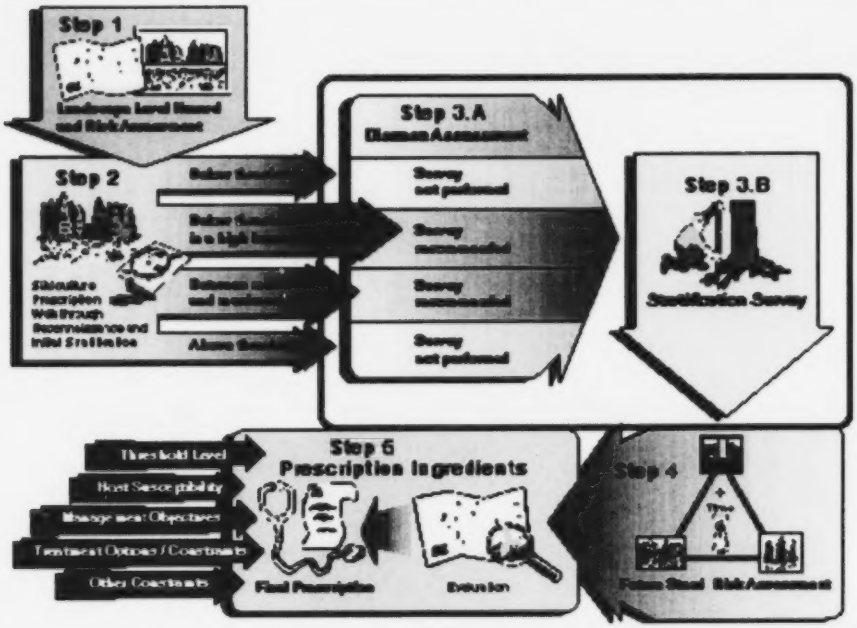
- **Become familiar with the five steps which must be performed in the management of root disease.**
- **Be able to identify the contents of the RDM Guide which are used in conducting the five steps.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Root Disease Five-Phase Management Process - Step 3



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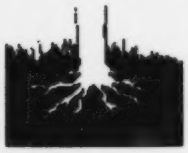
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



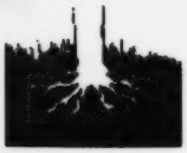
Root Disease Survey Methods

Participant Objectives

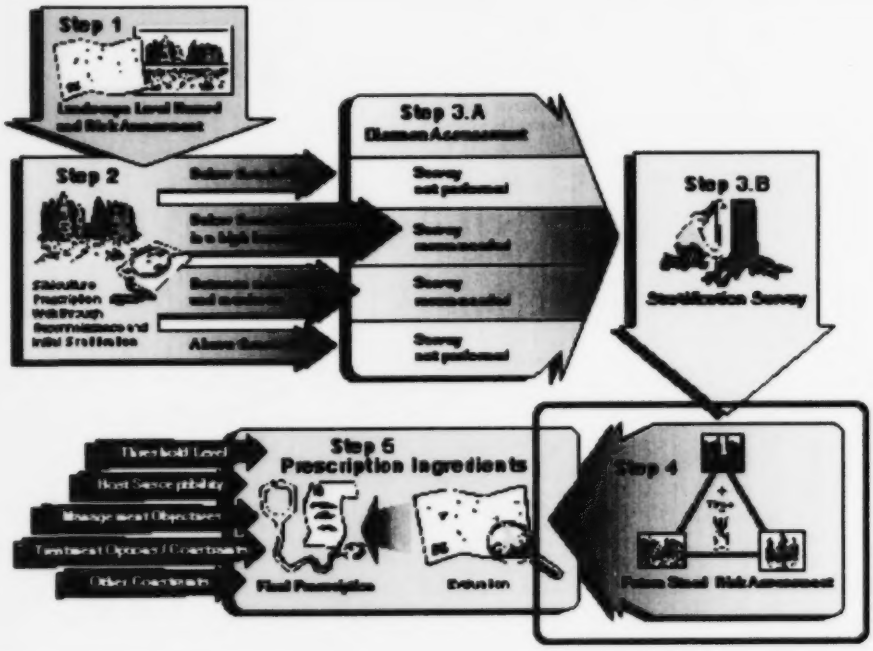
- **Become familiar with the five steps which must be performed in the management of root disease.**
- **Be able to identify the contents of the RDM Guide which are used in conducting the five steps.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Root Disease Five-Phase Management Process - Step 4



Participant Objectives

- **Become familiar with the five steps which must be performed in the management of root disease.**
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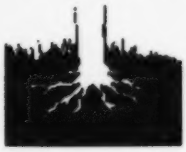
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



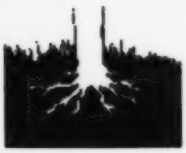
Future Stand Risk Assessment

Participant Objectives

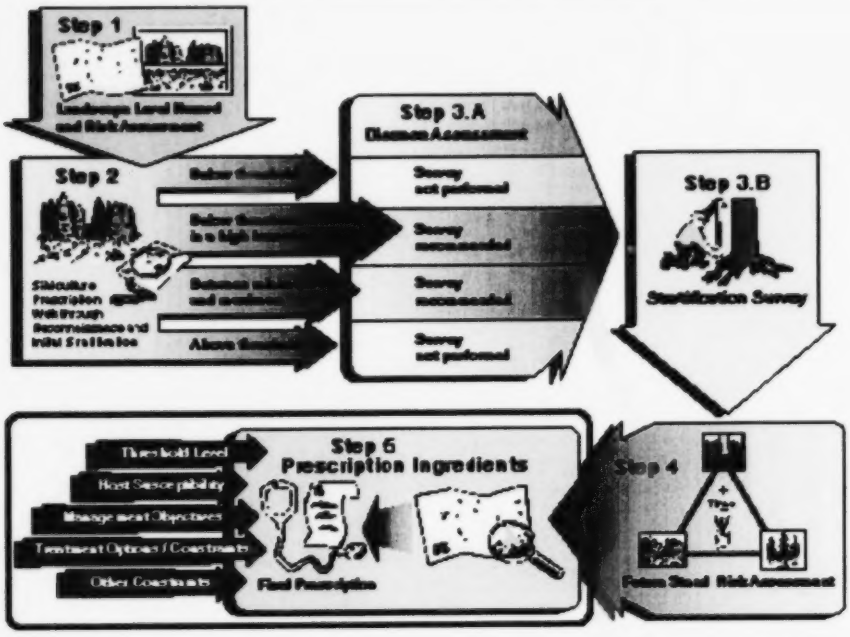
- **Become familiar with the five steps which must be performed in the management of root disease.**
- **Be able to identify the contents of the RDM Guide which are used in conducting the five steps.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Root Disease Five-Phase Management Process - Step 5



Participant Objectives

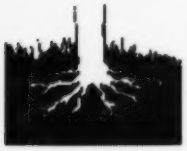
- **Become familiar with the five steps which must be performed in the management of root disease.**
- **Be able to identify the contents of the RDM Guide which are used in conducting the five steps.**

Exercise

1. The instructor will present you with several scenarios. BRIEFLY:
   - Suggest survey types which could be used to assess disease levels more accurately
   - Conduct a future stand risk assessment.
2. Discuss the reasons for the choice of survey which will be observed in Field Session 2.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Field Session

Silviculture Prescription Walkthrough Reconnaissance and Disease Assessment and Stratification Survey

Day 2 - Field Session 2

Perform/Observe Steps 2 and 3 of the Five-Phase Management Process - about 4 hours

1. Perform a Silviculture Prescription Walkthrough Reconnaissance
2. Determine the level of disease
3. Recommend for or against a survey and a survey method
4. Observe a survey which has been pre-arranged
5. Observe the forest site and disease conditions where data were collected for use in Classroom Session 3

Participant Objectives

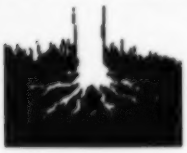
- **Learn how to conduct a field reconnaissance (walkthrough) and record requisite information.**
- **Learn how to determine threshold levels of a root disease infestation under field conditions and when to conduct a survey.**
- **Become familiar with the types of survey methods which can be used under regional and site circumstances and their strengths and weaknesses.**

Exercise/Discussion

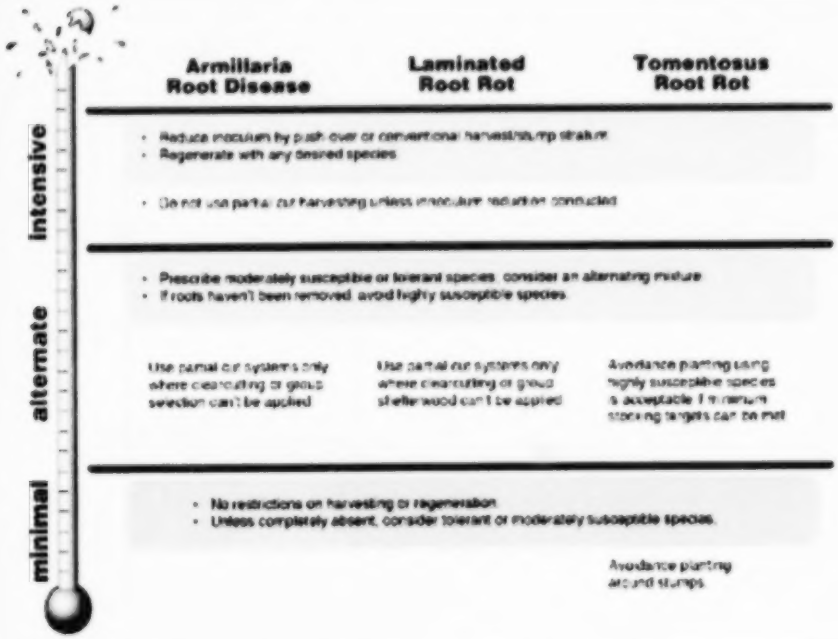
1. Perform a silviculture walkthrough assessment and discuss results in view of the threshold tables on pages 37 and 38 of the RDM Guide (Step 2).
2. Based on walkthrough observations, determine whether a survey is necessary; if so, discuss the types of surveys which would be suitable and the reasons supporting this recommendation (preparing for Step 3).
3. Examine the survey which the instructor has prepared ahead of time.
4. Visually assess the results of the instructor's prepared survey.
5. Discuss the reasons why this survey type was chosen.
6. Observe forest site and disease conditions where data were collected which will be used in Classroom Session 4.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Stand Management Prescriptions by Disease Treatment Level


Armillaria Root Disease
Laminated Root Rot
Tomentosus Root Rot
intensive
alternate
minimal
Reduce inoculum by push over or conventional harvest/stump strategy
Regenerate with any desired species
Do not use partial cut harvesting unless inoculum reduction conducted
Prescribe moderately susceptible or tolerant species, consider an alternating mixture
If roots haven't been removed, avoid highly susceptible species
Use partial cut systems only where clearcutting or group selection can't be applied
Use partial cut systems only where clearcutting or group shelterwood can't be applied
Avoidance planting using highly susceptible species is acceptable if minimum stocking targets can be met
No restrictions on harvesting or regeneration
Unless completely absent, consider tolerant or moderately susceptible species.
Avoidance planting around stumps

Day 2 Classroom Session 3
Perform Steps 4 and 5 of the Five-Phase Management Process: Evaluation, Future Stand Risk Assessment, and Final Prescription

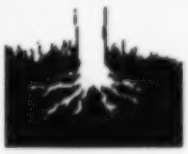
1. Future Stand Risk Assessment
2. Root Disease Treatment Evaluation
3. Treatment Methods: Strategies and Tactics

Learning Objectives

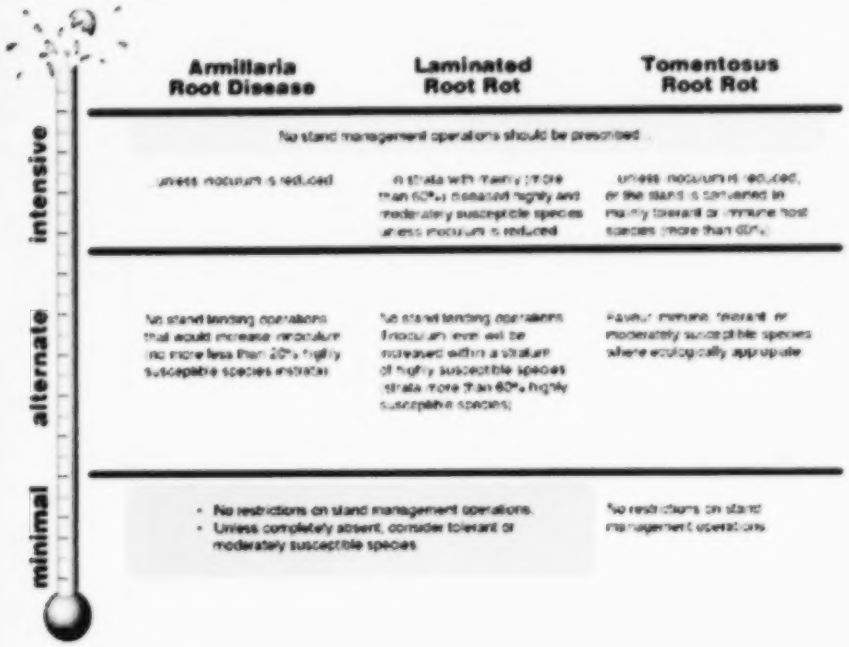
- **Demonstrate familiarity with the factors that influence future stand risk assessment, and how future stand risk assessment impacts prescription.**
- Demonstrate efficacy in the process of evaluating a root disease infestation and prescribing appropriate treatment.
- Recommend a disease treatment level, a treatment strategy and tactic based on survey results from Field Session 2.

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Silvicultural Prescriptions by Disease Treatment Level

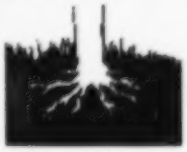

Armillaria Root Disease
Laminated Root Rot
Tomentosus Root Rot
intensive
alternate
minimal
No stand management operations should be prescribed
Unless inoculum is reduced
In strata with many (more than 60%) diseased highly and moderately susceptible species unless inoculum is reduced
Unless inoculum is reduced, or the stand is conserved in mainly tolerant or immune host species (more than 60%)
No stand tending operations that could increase inoculum (no more less than 20% highly susceptible species retained)
No stand tending operations (inoculum even will be increased within a stratum of highly susceptible species strata more than 60% highly susceptible species)
Favour immune, tolerant or moderately susceptible species where ecologically appropriate
• No restrictions on stand management operations.
• Unless completely absent, consider tolerant or moderately susceptible species
No restrictions on stand management operations

Learning Objectives

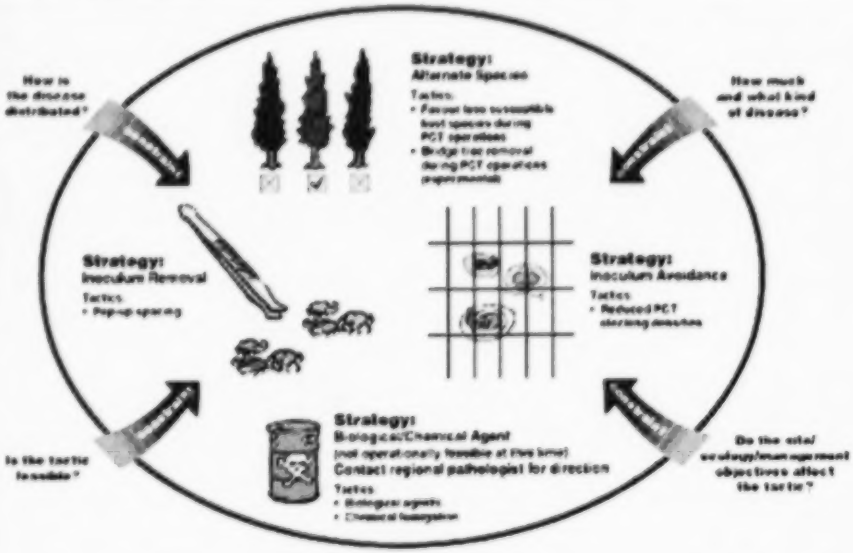
- Demonstrate familiarity with the factors that influence future stand risk assessment, and how future stand risk assessment impacts prescription.
- **Demonstrate efficacy in the process of evaluating a root disease infestation and prescribing appropriate treatment.**
- **Recommend a disease treatment level, a treatment strategy and tactic based on survey results from Field Session 2.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Strategies and Tactics for Stand Management Prescriptions



Learning Objectives

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- **Demonstrate efficacy in the process of evaluating a root disease infestation and prescribing appropriate treatment.**
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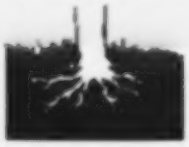
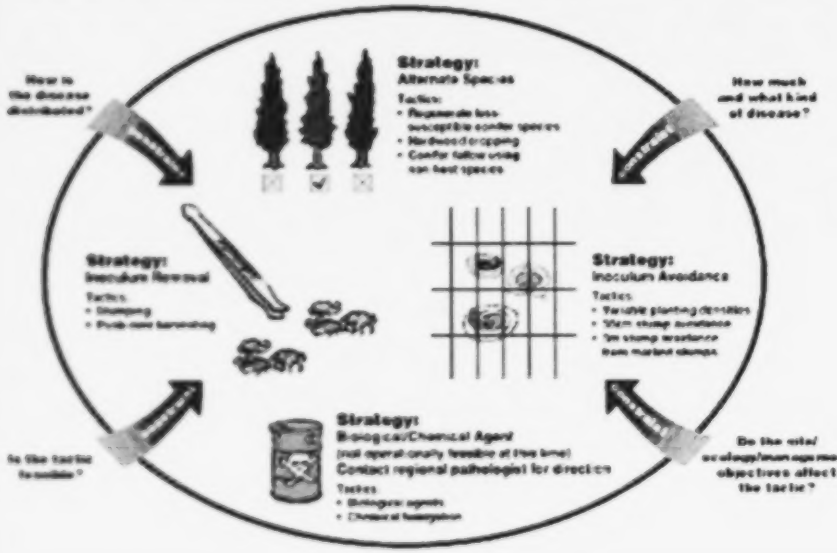
[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Strategies and Tactics for Silviculture Prescriptions

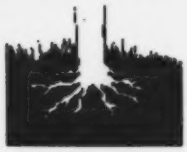


Learning Objectives

- Demonstrate familiarity with the factors that influence future stand risk assessment, and how future stand risk assessment impacts prescription.
- **Demonstrate efficacy in the process of evaluating a root disease infestation and prescribing appropriate treatment.**
- **Recommend a disease treatment level, a treatment strategy and tactic based on survey results from Field Session 2.**

[Next] [Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Final Exercise

Prepare a final prescription and supporting reasons based on:

- Field observations from Field Session 2
- Hypothetical scenarios

Considerations:

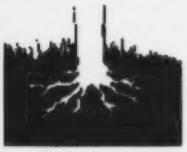
- Management objectives
- Treatment strategies and tactics
- Impact of forestry practices
- Future Stand Risk Assessment
- Constraining factors
- Disease level
- Species type
- Other non-timber resource values

Ideas to keep in mind while answering questions

1. How does the prescription fit in with stand objectives?
2. Why is this prescription the best?
3. What are the limitations of the prescription?
4. What are the expected consequences?
5. What additional information would you like to have to improve your prescription?

[Previous] [Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]



Acronym Glossary

AAC - Allowable annual cut
Ba - Amabilis fir (*abies amabilis*)
BEC - Biogeoclimatic ecosystem classification
Bg - Grand Fir (*abies grandis*)
BWBS - Boreal White and Black Spruce Zone
CDF - Costal Douglas-Fir Zone
Cw - Western Redcedar (*thuja plicata*)
CWH - Coastal Western Hemlock Zone
Cy - Yellow-cedar (*chamaecyparis nootkatensis*)
DRA - Armillaria Root Disease
DRB - Blackstain Root Disease
DRL - Laminated Root Rot
DRN - Annosus Root Disease
DRT - Tomentosus Root Rot
E - Birch (*betula spp.*)
ESSF - Engelmann Spruce Subalpine Fir Zone
Fd - Douglas-fir (*pseudotsuga menziesii*)
FG - Free-growing
HM - Mountain hemlock (*tsuga mertensiana*)
Hw - Western hemlock (*tsuga heterophylla*)
IBD - Douglas-fir Beetle
ICH - Interior Cedar-Hemlock Zone
IDF - Interior Douglas Fir Zone
ILM - Intersection Length method
IMPS - Intensity Measuring Pixel Survey
Lw - Western larch (*larix occidentalis*)
MS - Montane Spruce Zone
NP - Not productive
NR - Not recommended
NSR - Not satisfactorily restocked
NT - Not tested
PCT - Pre-commercial thinning
PI - Lodgepole Pine (*pinus contorta*)
PP - Ponderosa Pine Zone
Pw - Western white pine (*pinus monticola*)
Py - Ponderosa pine (*pinus ponderosa*)
RRSAMP - Root Rot Sampling Computer Program
S - Spruce (*picea spp*)
SBPS - Sub-boreal Pine and Spruce Zone
SBS - Sub-boreal Spruce Zone
Se - Engelmann spruce (*picea engelmannii*)
sph - Stems per hectare
Ss - Sitka spruce (*picea sitchensis*)
Sx - Intermediate spruce hybrid crosses (*picea crosses*)

TSA - Timber Supply Area

[Participant's Guide Table of Contents]

[Root Disease Management Course Home Page]